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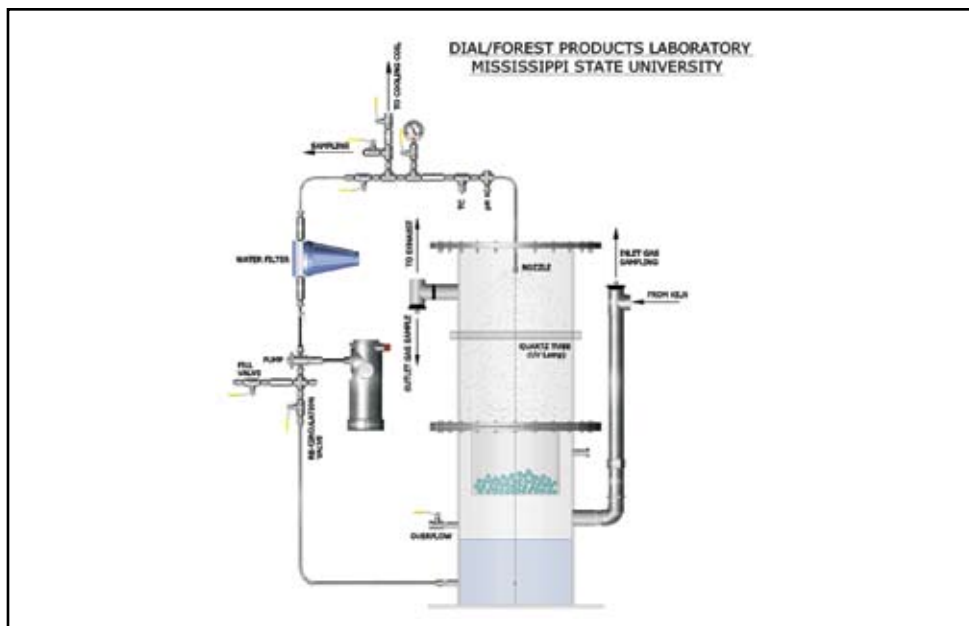
INDUSTRIAL TECHNOLOGIES PROGRAM

On-Line Oxidation of Volatile Compounds Generated by Sawmill Wood Kilns Ultra-Violet Chemical Oxidation Technique Promises Significantly Reduced Volatile Compound Emissions

Freshly sawn lumber contains approximately 30 to 50 percent water (green base) and must be dried to below 20 percent moisture content (dry base) for further use. The drying process is carried out through the use of kilns, which emit volatile organic compounds (VOC) into the atmosphere in the range of 2 to 16 pounds of carbon per thousand board feet. This is of particular concern in the southern United States, where 17 million board feet of southern yellow pine are harvested annually. Current emission control techniques (VOC recapture or VOC destruction) have not been effectively used in wood kilns, nor do they show promise for such application.

A relatively common chemical oxidation technique adapted to wood kilns promises to become a viable control technology for reducing emissions from lumber dry kilns. The technology combines ultra-violet (UV) light and hydrogen peroxide to provide an inexpensive way to effectively destroy VOC with virtually no impact on kiln operation.

Little progress was made when the liquid phase hydrogen peroxide treatment was implemented. Instead of utilizing UV light for the ionization of hydrogen peroxide, additional testing was conducted using Fenton's reagent (ferrous sulfate). Vapor phase ionization of hydrogen peroxide for VOC reduction is currently being evaluated.



Layout of the hydrogen peroxide vaporization system showing the VOC treatment process.



Benefits for Our Industry and Our Nation

The on-line oxidation of VOC could reduce VOC emissions by 80 percent and increase the total sales price of pinewood by less than 1 percent. In addition, the technology could reduce industry-wide VOC emissions by 58.9 million pounds annually by the year 2020.

Applications in Our Nation's Industry

Initially targeted at the U.S. southern pine wood market, on-line oxidation would provide a means for the entire lumber drying industry in the United States to reduce VOC emissions.

Project Partners

Mississippi State University
Starkville, MS

U.S. Peroxide
Colfax, CA

Project Description

The goal of this project is to develop a viable process for the oxidation of VOC from commercial wood kilns through the combination of UV light and hydrogen peroxide. The process involves passing the off-gas, which is generated during the drying of pine wood, through a scrubber. A recirculating solution of weak hydrogen peroxide is sprayed into the scrubber counter to the flow of the off-gas. The scrubber is illuminated through a quartz tube which houses a UV lamp. Gas samples for VOC analysis are extracted continuously from the inlet and outlet gas streams of the scrubber.

Barriers

- Optimizing several parameters (scrubber geometries, reaction pathways, ionization of peroxide at various concentrations, pH, and potential baffle designs) to ensure efficient reaction kinetics
- Providing a technology with low capital cost and energy usage for immediate, economic improvement to free-release of VOC

Pathways

The objectives of this project will be achieved through (1) establishing optimal reaction conditions, (2) determining the appropriate scrubber geometry and UV light introduction method/power and orientation, and (3) balancing process mass and energy and analyzing economics.

Milestones

- Summary reports on parameter testing and prototype design
- Completion of prototype unit
- Completion of industrial runs

Commercialization

The technology will be licensed to an industry partner with an established record in the peroxide, UV irradiation equipment, and/or sawmill industry. The technology will be demonstrated at the pilot-field level throughout the industry within 24 months of project completion. An aggressive marketing and publication strategy will be employed to provide information on the technology as soon as project design information is obtained.

For additional information, please contact:

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A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

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